United Nations

FCCC/ARR/2013/FIN

Framework Convention on Climate Change

Distr.: General
26 February 2014

English only

Report of the individual review of the annual submission of Finland submitted in 2013*

* In the symbol for this document, 2013 refers to the year in which the inventory was submitted, and not to the year of publication.

GE.14-60261

1460261

Please recycle

Contents

		Paragraphs	*Page*
I.	Introduction and summary	1–5	3
II.	Technical assessment of the annual submission	6–92	7
	A. Overview	6–22	7
	B. Energy	23–45	12
	C. Industrial processes and solvent and other product use	46–50	17
	D. Agriculture	51–66	18
	E. Land use, land-use change and forestry	67–72	23
	F. Waste	73–79	24
	G. Supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol	80–92	25
III.	Conclusions and recommendations	93–95	28
	A. Conclusions	93	28
	B. Recommendations	94	29
IV.	Questions of implementation	95	32
Annexes			
I.	Background data on recalculations and information to be included in the compilation and accounting database		33
II.	Documents and information used during the review		39
III.	Acronyms and abbreviations		41

I. Introduction and summary

1. This report covers the review of the 2013 annual submission of Finland, coordinated by the UNFCCC secretariat, in accordance with decision 22/CMP.1. The review took place from 2 to 7 September 2013 in Bonn, Germany, and was conducted by the following team of nominated experts from the UNFCCC roster of experts: generalists – Ms. Anna Romanovskaya (Russian Federation) and Ms. Daniela Romano (Italy); energy – Mr. Ole-Kenneth Nielsen (Denmark), Mr. Aidan Kennedy (Ireland) and Mr. Kaleem Mir (Pakistan); industrial processes and solvent and other product use – Ms. Sina Wartmann (Germany) and Mr. Dusan Vacha (Czech Republic); agriculture – Mr. Etienne Mathias (France) and Mr. James Douglas MacDonald (Canada); land use, land-use change and forestry (LULUCF) – Ms. Inês Mourão (Portugal) and Mr. Raehyun Kim (Republic of Korea); and waste – Ms. Medea Inashvili (Georgia) and Mr. Takefumi Oda (Japan). Ms. Inashvili and Mr. Nielsen were the lead reviewers. The review was coordinated by Mr. Matthew Dudley (UNFCCC secretariat).

2. In accordance with the "Guidelines for review under Article 8 of the Kyoto Protocol" (decision 22/CMP.1) (hereinafter referred to as the Article 8 review guidelines), a draft version of this report was communicated to the Government of Finland, which provided comments that were considered and incorporated, as appropriate, into this final version of the report. All encouragements and recommendations in this report are for the next annual submission, unless otherwise specified. The expert review team (ERT) notes that the 2012 annual review report of Finland was published after the submission of the 2013 annual submission.

3. In 2011, the main greenhouse gas (GHG) in Finland was carbon dioxide (CO_2), accounting for 84.3 per cent of total GHG emissions[1] expressed in CO_2 equivalent (CO_2 eq), followed by nitrous oxide (N_2O) (7.8 per cent) and methane (CH_4) (6.3 per cent). Hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphur hexafluoride (SF_6) collectively accounted for 1.6 per cent of the overall GHG emissions in the country. The energy sector accounted for 79.6 per cent of total GHG emissions, followed by the agriculture sector (8.8 per cent), the industrial processes sector (8.3 per cent), the waste sector (3.2 per cent) and the solvent and other product use sector (0.1 per cent). Total GHG emissions amounted to 67,033.43 Gg CO_2 eq and decreased by 4.8 per cent between the base year[2] and 2011. The ERT concludes that the description in the national inventory report (NIR) of the trends for the different gases and sectors is reasonable.

4. Tables 1 and 2 show GHG emissions from sources included in Annex A to the Kyoto Protocol (hereinafter referred to as Annex A sources), emissions and removals from the LULUCF sector under the Convention and emissions and removals from activities under Article 3, paragraph 3, and, if any, elected activities under Article 3, paragraph 4, of the Kyoto Protocol (KP-LULUCF), by gas and by sector and activity, respectively. In table 1, CO_2, CH_4 and N_2O emissions included in the rows under Annex A sources do not include emissions and removals from the LULUCF sector.

[1] In this report, the term "total GHG emissions" refers to the aggregated national GHG emissions expressed in terms of CO_2 eq excluding LULUCF, unless otherwise specified.

[2] "Base year" refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. The base year emissions include emissions from Annex A sources only.

5. Additional background data on recalculations by Finland in the 2013 annual submission, as well as information to be included in the compilation and accounting database, can be found in annex I to this report.

Table 1

Greenhouse gas emissions from Annex A sources and emissions/removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, by gas, base year[a] to 2011

			Gg CO_2 eq							*Change (%)*
		Greenhouse gas	*Base year[a]*	*1990*	*1995*	*2000*	*2008*	*2009*	*2010*	*2011*	*Base year–2011*
Annex A sources		CO_2	56 642.96	56 642.96	57 908.81	56 859.61	58 006.79	55 056.58	63 584.08	56 492.84	–0.3
		CH_4	6 330.07	6 330.07	6 120.79	5 422.61	4 376.73	4 300.69	4 353.04	4 219.75	–33.3
		N_2O	7 364.26	7 364.26	6 770.28	6 494.99	6 785.86	5 759.68	5 414.54	5 257.74	–28.6
		HFCs	29.33	0.02	29.33	491.76	993.19	888.83	1 163.96	1 025.91	3 398.0
		PFCs	0.14	0.07	0.14	22.46	11.23	9.32	0.75	1.38	882.7
		SF_6	71.29	114.94	71.29	53.97	51.16	49.82	35.07	35.82	–49.8
KP-LULUCF	Article 3.3[b]	CO_2					3 823.84	3 500.78	3 673.34	3 459.25	
		CH_4					0.00	0.00	0.00	NA, NO, IE, NE	
		N_2O					0.18	0.19	0.24	0.25	
	Article 3.4[c]	CO_2	NA				–39 076.50	–49 775.06	–34 645.91	–34 815.34	NA
		CH_4	NA				1.26	1.11	0.67	1.04	NA
		N_2O	NA				35.47	24.91	22.70	21.50	NA

Abbreviations: IE = included elsewhere, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, NA = not applicable, NE = not estimated, NO = not occurring.

[a] "Base year" for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. For activities under Article 3, paragraph 3, of the Kyoto Protocol and forest management under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.

[b] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation.

[c] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation.

Table 2
Greenhouse gas emissions by sector and activity, base year[a] to 2011

			Gg CO_2 eq							*Change (%)*
		Sector	*Base year[a]*	*1990*	*1995*	*2000*	*2008*	*2009*	*2010*	*2011*	*Base year–2011*
Annex A		Energy	54 494.93	54 494.93	56 063.48	54 464.87	54 758.41	52 679.77	60 550.11	53 384.91	–2.0
		Industrial processes	5 115.81	5 130.08	4 699.08	5 582.97	7 165.16	5 348.06	5 772.53	5 585.86	9.2
		Solvent and other product use	178.37	178.37	142.77	124.71	86.59	72.27	73.58	69.83	–60.9
		Agriculture	6 674.33	6 674.33	6 084.25	5 901.67	5 931.53	5 778.37	5 969.70	5 881.11	–11.9
		Waste	3 974.60	3 974.60	3 911.06	3 271.16	2 283.26	2 186.45	2 185.52	2 111.73	–46.9
		LULUCF	NA	–15 162.01	–14 138.07	–20 451.54	–29 635.18	–39 273.78	–24 623.70	–24 577.44	NA
		Total (with LULUCF)	**NA**	**55 290.29**	**56 762.56**	**48 893.85**	**40 589.77**	**26 791.14**	**49 927.73**	**42 456.00**	**NA**
		Total (without LULUCF)	**70 438.04**	**70 452.31**	**70 900.64**	**69 345.39**	**70 224.95**	**66 064.92**	**74 551.43**	**67 033.43**	**–4.8**
		Other[b]	NA	NA	NA	NA	NA	NA	NA	NA	NA
KP-LULUCF	Article 3.3[c]	Afforestation and reforestation					217.09	205.58	184.01	158.45	
		Deforestation					3 606.94	3 295.39	3 489.58	3 301.06	
		Total (3.3)					**3 824.03**	**3 500.97**	**3 673.58**	**3 459.50**	
	Article 3.4[d]	Forest management					–39 039.77	–49 749.05	–34 622.54	–34 792.80	
		Cropland management	NA				NA	NA	NA	NA	NA
		Grazing land management	NA				NA	NA	NA	NA	NA
		Revegetation	NA				NA	NA	NA	NA	NA
		Total (3.4)	**NA**				**–39 039.77**	**–49 749.05**	**–34 622.54**	**–34 792.80**	**NA**

Abbreviations: KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NA = not applicable.

[a] "Base year" for Annex A sources refers to the base year under the Kyoto Protocol, which is 1990 for CO_2, CH_4 and N_2O, and 1995 for HFCs, PFCs and SF_6. For activities under Article 3, paragraph 3, of the Kyoto Protocol and forest management under Article 3, paragraph 4, only the inventory years of the commitment period must be reported.

[b] Emissions/removals reported in the sector other (sector 7) are not included in Annex A to the Kyoto Protocol and are therefore not included in national totals.

[c] Activities under Article 3, paragraph 3, of the Kyoto Protocol, namely afforestation and reforestation, and deforestation.

[d] Elected activities under Article 3, paragraph 4, of the Kyoto Protocol, including forest management, cropland management, grazing land management and revegetation.

II. Technical assessment of the annual submission

A. Overview

1. Annual submission and other sources of information

6. The 2013 annual inventory submission was submitted on 15 April 2013; it contains a complete set of common reporting format (CRF) tables for the period 1990–2011 and an NIR. Finland also submitted the information required under Article 7, paragraph 1, of the Kyoto Protocol, including information on: activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, accounting of Kyoto Protocol units, changes in the national system and in the national registry, and the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol. The standard electronic format (SEF) tables were submitted on 15 April 2013. The annual submission was submitted in accordance with decision 15/CMP.1.

7. Finland officially submitted revised emission estimates on 6 September 2013 in response to questions raised by the ERT during the review in relation to the agriculture sector (see para. 57 below).

8. The full list of materials used during the review is provided in annex II to this report.

2. Overall assessment of the inventory

9. Table 3 contains the ERT's overall assessment of the annual submission of Finland. For recommendations for improvements related to cross-cutting issues for specific categories, please see the paragraphs cross-referenced in the table.

Table 3
The expert review team's overall assessment of the annual submission

		General findings and recommendations
The expert review team's (ERT's) findings on completeness of the 2013 annual submission		
Annex A sources[a]	Complete	Mandatory: None
		Non-mandatory: "NE" is reported for N_2O emissions from industrial wastewater and domestic and commercial wastewater (without human sewage) (see para. 79 below)
Land use, land-use change and forestry[a]	Complete	Mandatory: None
		Non-mandatory: "NE" is reported for the dead organic matter pool for cropland remaining cropland, living biomass for grassland remaining grassland, and all pools for wetlands remaining wetlands and settlements remaining settlements
KP-LULUCF	Complete	
The ERT's findings on recalculations and time-series consistency in the 2013 annual submission	Generally consistent	Potential time-series issues were identified by the ERT (see paras. 40 and 42 below)
The ERT's findings on verification and quality assurance/quality control procedures in the 2013 annual submission	Sufficient	The ERT identified some minor issues in relation to QA/QC (see para. 15 below)
The ERT's findings on the transparency of the 2013 annual submission	Sufficient	The ERT identified some transparency issues in the energy, agriculture, waste and LULUCF sectors (see paras. 26, 52, 54, 55, 59, 60 74, 78 and 82 below)

Abbreviations: Annex A sources = sources included in Annex A to the Kyoto Protocol, ERT = expert review team, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NE = not estimated, QA/QC = quality assurance/quality control.

[a] The assessment of completeness by the ERT considers only the completeness of reporting of mandatory categories (i.e. categories for which methods and default emission factors are provided in the Intergovernmental Panel on Climate Change (IPCC) *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, or the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*).

3. Description of the institutional arrangements for inventory preparation, including the legal and procedural arrangements for inventory planning, preparation and management

Inventory planning

10. The NIR and additional information provided by the Party during the review described the national system for the preparation of the inventory. Statistics Finland has overall responsibility for the national inventory. Other agencies and organizations are also involved in the preparation of the inventory.

11. Finland's national system is described in a report published by Statistics Finland in 2005. Some of the agreements with ministries and agreements, including reporting protocols, with expert organizations have been updated since 2005, due to changes in roles and responsibilities, and the changes have been reported in the NIR.

12. The expert organizations involved in the preparation of the inventory at the sectoral level are: the Finnish Environment Institute (SYKE), responsible for estimating emissions from the waste sector and emissions of fluorinated gases; and MTT Agrifood Research Finland and the Finnish Forest Research Institute, responsible for estimating emissions from the agriculture and LULUCF sectors. The calculation of emissions from the energy and industrial processes sectors is under the responsibility of Statistics Finland, where VTT Technical Research Centre of Finland is in charge of estimating emissions from transport, except for aviation. As for aviation, up to 2009, Finavia (formerly the Civil Aviation Administration) provided emission calculations and was responsible for these data; from 2010, Statistics Finland is responsible for compiling emissions from aviation.

13. In response to a recommendation made in the previous review report, Finland clarified in its NIR the institutional responsibilities related to the process of calculating emissions from aviation activities. The new process to estimate these emissions will utilize information and data from Eurocontrol; however, it is unlikely that these data can be provided to Finland until late 2013, after which they will be assessed for their appropriateness in the inventory compilation process. Finland has also addressed a related recommendation made in the previous review report relating to progressing the use of the Eurocontrol data. The ERT encourages Finland to explore an alternative basis to estimate aviation emissions in case Eurocontrol information and data are deemed inappropriate for use in the inventory compilation process. Further, the ERT encourages Finland to report in its annual submission the outcomes of the assessment of Eurocontrol information and data.

14. Different data sources are used by Finland to compile its inventory. Besides the official national yearbooks, the VAHTI system of Finland's environmental administration is one of the main data sources used in the inventory, especially in the energy and waste sectors. The system contains information on the environmental permits of clients and on their wastes generated, discharges into water and emissions to air. In addition, information from the European Union emissions trading scheme (EU ETS), obtained by the Energy Market Authority, is becoming more and more important as a source of activity data (AD) and emissions for the national inventory. Figures from the EU ETS are used in particular to estimate emissions in the industrial processes sector and for the verification of fuel consumption and CO_2 emissions of some point sources in the energy sector.

15. Statistics Finland has overall responsibility for the inventory quality assurance/quality control (QA/QC) procedures. The NIR presents an extensive description of Finland's quality objectives and QA/QC plan; category-specific QA/QC and verification activities are also included in the relevant chapters in response to an encouragement made in the previous review report. However, some inconsistencies are still observed regarding the conformity of information reported in the NIR and that reported in the relevant CRF tables (e.g. CRF table NIR-3 in regards to information on key categories; reporting of the emission factor (EF) for liquid fuels in road transportation (see para. 45 below); area of

wetlands remaining wetlands (see para. 71 below); CO_2 emissions from agricultural lime application (see para. 72 below); data on liming (see para. 82 below)). The ERT recommends that Finland check the description in the NIR against the information and figures reported in the CRF tables in its annual submission.

16. Finland implements QA and verification procedures during the annual compilation of the inventory. Internal audits and peer reviews of the inventory occur periodically, mostly focusing on sectoral areas. As for all its member States, the European Commission implements QA/QC checks of Finland's inventory annually, and in 2012 a technical review of each EU member State's inventory was conducted by a European Technical Expert Review Team of the European Commission. In response to a question raised by the ERT during the review in regard to a future planned third-party audit of the whole inventory, Finland stated that this is a resource-intensive activity but a greater possibility is to conduct a third-party audit once the Intergovernmental Panel on Climate Change (IPCC) *2006 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the 2006 IPCC Guidelines) have been implemented. The ERT encourages Finland to implement such an analysis according to the availability of financial and human resources.

17. Statistics Finland compiles an annual improvement plan; the planned improvements are specified in the NIR together with a tentative time frame for their implementation. Additionally, in the NIR, in response to a recommendation made in the previous review report, Finland has also verified the conformity between the list of planned improvements in chapter 10 of the NIR and each planned improvement provided in the relevant sectoral chapters.

Inventory preparation

18. Table 4 contains the ERT's assessment of Finland's inventory preparation process.

Table 4
Assessment of inventory preparation by Finland

		General findings and recommendations
Key category analysis		
Was the key category analysis performed in accordance with the Intergovernmental Panel on Climate Change (IPCC) *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF)?	Yes	
Approach followed?	Tier 2	
Were additional key categories identified using a qualitative approach?	No	
Has the Party identified key categories for activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol following the guidance on establishing the relationship between the activities under the Kyoto	Yes	The ERT identified that CRF table NIR-3 had not been filled in with the requested information

		General findings and recommendations
Protocol and the associated key categories in the UNFCCC inventory?		
Does the Party use the key category analysis to prioritize inventory improvements?	Yes	
Are there any changes to the key category analysis in the latest submission?	Yes	There has been a re-evaluation of the uncertainty analysis and also the disaggregation of the categories in the energy sector. The resulting changes slightly altered the key category list
Assessment of uncertainty analysis		
Approach followed?	Both tier 1 and tier 2	Finland performs a tier 1 uncertainty analysis annually, and complements this with a tier 2 analysis that is undertaken periodically. Both analyses were undertaken in the 2013 annual submission
Was the uncertainty analysis carried out in accordance with the IPCC good practice guidance and the IPCC good practice guidance for LULUCF?	Yes	
Quantitative uncertainty (including LULUCF)	Level = –25% to +34% (tier 2) Level = ±32% (tier 1) Trend = –25% to +32% (tier 2) Trend = ±33% (tier 1)	
Quantitative uncertainty (excluding LULUCF)	Level = –4% to +7% (tier 2) Level = ±6% (tier 1) Trend = –5% to +5% (tier 2) Trend = ±8% (tier 1)	

Abbreviations: CRF = common reporting format, ERT = expert review team, LULUCF = land use, land-use change and forestry, NIR = national inventory report.

Inventory management

19. Finland has a centralized archiving system, which includes the archiving of disaggregated EFs and AD, and documentation on how these factors and data have been generated and aggregated for the preparation of the inventory. The archived information also includes internal documentation on QA/QC procedures, external and internal reviews, and documentation on annual key categories and key category identification and planned inventory improvements. The centralized system is kept at Statistics Finland and is linked to the archiving systems of the expert organizations responsible for the sectoral emission calculations.

4. Follow-up to previous reviews

20. Finland has addressed most recommendations made in the previous review report. The Party continues to improve the transparency of its NIR, such as by providing enhanced information relating to institutional responsibilities in regard to each stage of the inventory compilation (estimation) process, especially for aviation. Further, in regard to the energy sector, a plan for the systematic checking of EFs has been established and Finland will report on progress in this regard in its next annual submission. The ERT also noted that there has been considerable improvement in the transparency of methodologies and the rationale behind the choice of uncertainty figures in the NIR, especially for the LULUCF sector. The ERT commends Finland for all these improvements.

21. Nevertheless, the ERT identified that some recommendations made in the previous review report have not been addressed by Finland in its 2013 annual submission (see paras. 26, 34, 68, 69 and 70 below).

5. Areas for further improvement identified by the expert review team

22. During the review, the ERT identified a number of areas for improvement, including some related to specific categories. These are listed in the relevant chapters of this report and in table 8 below.

B. Energy

1. Sector overview

23. The energy sector is the main sector in the GHG inventory of Finland. In 2011, emissions from the energy sector amounted to 53,384.91 CO_2 eq, or 79.6 per cent of total GHG emissions. Since 1990, emissions have decreased by 2.0 per cent. The key drivers for the fall in emissions are decreases in emissions from manufacturing industries and construction (27.6 per cent), followed by the category other sectors (43.6 per cent). These decreases were attenuated to a large extent by a 28.4 per cent increase in emissions from energy industries. It should be noted, however, that owing to the structure of the Nordic electricity market, the level of emissions from public electricity and heat production in Finland shows large inter-annual variations, mainly as a consequence of the fluctuations in hydropower production in Sweden and Norway. Within the energy sector, 46.1 per cent of the emissions were from energy industries, followed by 24.8 per cent from transport, 18.1 per cent from manufacturing industries and construction and 7.6 per cent from other sectors. The category other (energy) accounted for 3.1 per cent and fugitive emissions from oil and natural gas accounted for the remaining 0.3 per cent.

24. The ERT noted that Finland has reported in a very transparent manner on the follow-up to previous review reports in chapter 10 of the NIR. In its 2013 annual submission, Finland has addressed most of the recommendations and encouragements made in the previous review report in relation to the energy sector (e.g. establishing a plan for the systematic checking of EFs). The ERT commends Finland for its transparent reporting on the actions taken in response to recommendations made in previous review reports and for the fast and comprehensive implementation of the recommendations.

25. Finland's reporting on the energy sector is generally transparent regarding methodological descriptions, AD and EFs. However, the lack of transparency due to presenting aggregated AD for the energy sector in the NIR has been identified by previous review reports (see para. 26 below).

26. In the previous review report, the ERT noted that the AD in the energy sector presented in the NIR were aggregated in terms of both categories and fuels, making it

difficult to interpret the fluctuations in the time series of implied emission factors (IEFs) and consequently causing the same questions to arise regularly during reviews. In the follow-up to recommendations made in the previous review report, Finland provided qualitative information regarding the most important fuels included in the other fuels categories; however, disaggregated data were not provided. In response to a question raised by the ERT during the review, Finland stated that further disaggregation would require changes to the entire time series and inventory system, which would not be resource efficient to implement for one year. Therefore, this will only be considered for the 2015 annual submission. The ERT accepts that these changes may be resource-heavy and therefore recommends that efforts be made to provide disaggregated data in the 2015 annual submission.

27. The QC for the energy sector is carried out in accordance with the overall QC plan for the inventory. The QC activities are well documented in the NIR and include both general tier 1 checks and category-specific checks. In the past, Finland has had projects with Sweden and Germany, where the Parties review each other's inventories. While acknowledging that it can be difficult to find qualified national experts not already involved directly or indirectly in the preparation of the inventory, the previous ERT encouraged Finland to explore the possibility of having a review of the energy sector inventory, or parts thereof, performed by an expert with in-depth knowledge of Finland's energy sector; for example, reviewers could be invited from universities, research institutions, companies or industrial associations.

28. Although not addressed in the 2013 annual submission, in response to a question raised by the ERT during the review, Finland stated that the possibility of a third-party audit of the energy sector or part thereof has been considered, but that due to resource implications it would consider it more appropriate to conduct an audit after the implementation of the 2006 IPCC Guidelines. The ERT encourages Finland to outline any progress regarding future third-party audits in its annual submission.

29. The ERT noted that Finland has listed a number of planned improvements for the energy sector in its NIR, both in the energy sector chapter and in chapter 10. The improvements include, for example, the improvement of the models used to calculate emissions from transport and from space heating of houses. Following the recommendation made in the previous review report, Finland has incorporated planned improvements mentioned in the energy chapter into the summary in chapter 10. The ERT commends Finland for identifying planned improvements in a very transparent manner.

2. Reference and sectoral approaches

30. Table 5 provides a review of the information reported under the reference approach and the sectoral approach, as well as comparisons with other sources of international data. Issues identified in table 5 are more fully elaborated in paragraph 31 below.

Table 5
Review of reference and sectoral approaches

		Paragraph cross-reference
Difference between the reference approach and the sectoral approach	Energy consumption: 21.98 PJ, 3.27% CO_2 emissions: 1,298.55 Gg CO_2, 2.5%	
Are differences between the reference approach and the sectoral approach adequately explained in the NIR and the CRF tables?	Yes	
Are differences with international statistics adequately explained?	Yes	
Is reporting of bunker fuels in accordance with the UNFCCC reporting guidelines?	Yes	
Is reporting of feedstocks and non-energy use of fuels in accordance with the UNFCCC reporting guidelines?	Yes	(see paras. 33, 34 and 35 below)

Abbreviations: CRF = common reporting format, NIR = national inventory report, UNFCCC reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories".

Comparison of the reference approach with the sectoral approach and international statistics

31. Finland estimated CO_2 emissions from fossil fuel combustion using the reference approach and the sectoral approach for all years of the time series. The difference for 2011 (as shown in table 5) is slightly greater than for preceding years (e.g. for 2008, 2009 and 2010 the difference is 0.7 per cent, 0.9 per cent and 0.4 per cent, respectively). This has been explained in the NIR as being due to statistical differences in the oil balances resulting from product changes in the national reserve stocks. The estimates for the early years of the time series exhibit the largest differences, especially those for 1992 and 1993 (difference of –8.4 per cent and –6.4 per cent, respectively). The ERT noted and agrees with the explanations provided by Finland in the NIR in response to recommendations made in previous review reports. It also agrees that dedicating significant resources to exploring the reason for, and trying to reduce, the difference between the estimates for 1992 and 1993 calculated using the two approaches should not be prioritized over more important planned improvements. When compared, the International Energy Agency (IEA) data and the data reported by Finland are generally consistent.

International bunker fuels

32. No problems were identified.

Feedstocks and non-energy use of fuels

33. Finland has reported information on the non-energy use of fuels in the subcategory feedstocks and non-energy use of fuels (CRF table 1.A(d)). The ERT noted that in the case of lubricants, the additional information part of the CRF table is not complete. In response to a question raised by the ERT during the review, Finland stated that it is awaiting clarification of the assumptions and allocation of emissions related to the use of lubricants

(postponed until the 2014 annual submission). The ERT recommends that Finland complete the additional information part of CRF table 1.A(d) for lubricants.

34. In the previous review report, the ERT noted that for lubricants and coke the fraction of carbon stored was reported as 0.33 and 0.46, respectively, in CRF table 1.A(d) with the indication that the remaining carbon has been included in the reporting on fuel combustion. However, it was not completely clear from the CRF tables and the NIR how the emissions were allocated. In response to a question raised by the ERT during the review, Finland provided detailed information on the assumptions and allocation of emissions related to the use of lubricants. The ERT reiterates the recommendation made in the previous review report that Finland include this information in its annual submission.

35. A discrepancy exists between the liquid fuels data given in CRF tables 1.A(c) and 1.A(d) for the years 2002 and 2011 (–0.04 PJ and 1.2 PJ, respectively). In response to a question raised by the ERT during the review, Finland stated that these were due to errors in the tables (table 1.A(c)). The ERT recommends that Finland correct these in its annual submission.

Country-specific issues

36. Finland has reported negative CO_2 emissions (172.31 Gg in 2011) in the subcategory transferred CO_2 (other (manufacturing industries and construction)) in CRF tables 1 and 1.A(a). In its NIR, Finland has explained that these emissions consist of CO_2 from energy production, which is captured in the production of precipitated calcium carbonate (PCC). PCC is widely used in different kinds of paper and paperboard production as a filling or coating material and the CO_2 is considered to be stored over the long term, which is the main criterion used for the inclusion of this CO_2 capture and storage in the inventory.

37. As noted by previous review reports, the reporting on this country-specific issue is fully transparent. On the basis of the documentation provided by Finland, the ERT agrees with the assumption of long-term storage of CO_2 captured in PCC. The *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* (hereinafter referred to as the Revised 1996 IPCC Guidelines) and the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* (hereinafter referred to as the IPCC good practice guidance) do not contain any guidance on how to report CO_2 capture and storage. The ERT considers that the avoided emissions should have been reported under the energy sector in the category manufacturing industries and construction and, in general, the principle is that emissions and recovery should be reported under the category where they occurred. On that basis, the ERT concludes that the allocation made by Finland is appropriate.

3. Key categories

Stationary combustion: all fuels – CO_2

38. The previous review report noted that most of the country-specific CO_2 EFs used by Finland to estimate emissions are constant throughout the time series, with the exception of fuels for which plant-specific data are available (e.g. coal, petroleum coke and refinery gas). The majority of the country-specific CO_2 EFs were derived from studies conducted around 2005. No procedure is in place to periodically check whether those EFs are still applicable, with the exception of those EFs for fuels for which there is a broad coverage of plant-specific data, as is the case for peat. For example, the Finnish oil company Neste is the source of many of the EFs for liquid fuels used in the inventory, but it has not been approached with a view to reviewing the validity of the EFs in recent years.

39. In response to a recommendation made in the previous review report, Finland stated in its NIR that a plan for the systematic checking of EFs will be established in 2013. The ERT encourages Finland to include in its annual submission details of this plan and progress to date in its implementation.

40. Beginning with its 2012 annual submission, Finland has started to use plant-specific data (e.g. on carbon contents and calorific values) as a basis for the estimation of the CO_2 EF for coal used in public electricity and heat production. These EFs are somewhat lower than the country-specific EF used for the period 1990–2007. Given the detailed data provided by the plants in accordance with the monitoring guidelines under the EU ETS, the previous review report considered these plant-specific CO_2 EFs to be accurate and to have been prepared in accordance with the IPCC good practice guidance. The ERT noted that, in annex 3 to the NIR, Finland has described a study that examined the applicability of the default EF to Finnish conditions and that the study concluded that the default EF was suitable. However, the ERT also noted that the rapid decrease in the CO_2 EF between 2007 and 2008 could indicate that the emissions for the preceding years have been overestimated. The ERT agrees with the finding of the previous review report and recommends that Finland investigate the time-series consistency of the CO_2 EF; for example, Finland could explore whether there have been changes in the country of origin of the coal or whether changes in the net calorific value of coal could explain the decrease in the CO_2 EF and report thereon in its NIR. In response to the draft review report Finland informed the ERT that the applicability of the default EF in Finland for the years 2004–2007 could be further investigated, but that Finland will not prioritize this matter over more urgent development needs. The ERT agrees that this is not a matter of urgency and that other improvements should be given higher priority.

41. . The ERT noted that, in response to a recommendation made in the previous review report, Finland reallocated emissions from gasified fossil waste to the subcategory other fuels rather than gaseous fuels. The ERT commends Finland for this improvement.

42. The previous review report identified that the CO_2 IEF value for liquid fuels used in petroleum refining decreased significantly between 2004 and 2005 (by 6.6 per cent). This was because plant-specific data were used to calculate the CO_2 EF from 2005 onwards, while information received from the plants in the late 1990s was used to calculate a CO_2 EF that was kept constant between 1990 and 2004. While the ERT considered the plant-specific data to be accurate and to have been prepared in accordance with the IPCC good practice guidance, it noted that the large drop in the CO_2 IEF from 2004 to 2005 was not realistic and could infer an overestimation of emissions for the earlier part of the time series, including for 1990. The ERT recommends that Finland include the improvement or revision of the time-series consistency of the CO_2 EF for liquid fuels used in petroleum refining in the inventory improvement plan and report thereon in its annual submission. In response to the draft review report Finland informed the ERT that work on finding the reason for the decrease in the IEF has been initiated, but currently there is no clear explanation available and therefore it would not be possible to clarify the issue in the 2014 annual submission.

4. Non-key categories

Civil aviation: liquid fuels – CO_2, CH_4 and N_2O

43. In its 2011 annual submission Finland reported that it planned to start using AD available from the Eurocontrol data portal for estimating emissions for this category for its 2012 annual submission onwards. However, as mentioned in both its 2012 and 2013 annual submissions, the project has not progressed as anticipated and a date for completion of the work has not been set.

44. The ERT noted that in its 2013 annual submission, Finland indicated that it would receive data from Eurocontrol in August 2013 and that it would evaluate, based on these data, whether the option of using Eurocontrol data in the future is a valid one, or whether any identified alternatives will need to be explored further. The ERT encourages Finland to report on the outcome of this evaluation in its annual submission and to indicate whether this improvement is expected to go ahead.

Road transportation: liquid fuels – CO_2

45. The ERT noted that the CO_2 IEF for biomass in road transportation increased from 65.47 t/TJ in 2010 to 71.26 t/TJ in 2011. This did not seem correct, as the AD suggest that a large share of biomass consumption in road transportation was composed of the biogenic part of motor gasoline which, according to table 3.2-3 of the NIR, had an EF of 59 t/TJ. In response to a question raised by the ERT during the review, Finland explained that the EF and net calorific value of the biogenic part of motor gasoline varies depending on its composition, and that the values given in table 3.2-3 were not representative of the actual situation. The ERT recommends that Finland include the correct range of values in its annual submission.

C. Industrial processes and solvent and other product use

1. Sector overview

46. In 2011, emissions from the industrial processes sector amounted to 5,585.86 Gg CO_2 eq, or 8.3 per cent of total GHG emissions, and emissions from the solvent and other product use sector amounted to 69.83 Gg CO_2 eq, or 0.1 per cent of total GHG emissions. Since 1990, emissions have increased by 9.2 per cent in the industrial processes sector, and decreased by 60.9 per cent in the solvent and other product use sector. The key drivers for the rise in emissions in the industrial processes sector are significant increases in the consumption of halocarbons and metal production, which is in contrast to the fall in emissions from chemical industry. Within the industrial processes sector, 42.4 per cent of the emissions were from metal production, followed by 23.4 per cent from mineral products, 19.0 per cent from consumption of halocarbons and SF_6 and 15.2 per cent from chemical industry.

47. Finland's inventory for the industrial processes and solvent and other product use sectors is complete, including emission estimates for all relevant categories, gases and years, and is also complete in terms of geographical coverage. The reporting is transparent regarding the sources of AD and EFs and the methods and assumptions used for the entire time series. Finland has provided a full explanation of the uncertainty estimates and QA/QC procedures for all categories, including the verification of emission estimates by comparing them with emission estimates reported under the EU ETS. Finland has provided information about time-series consistency and justified its approach. The ERT noted that Finland has implemented all of the recommendations related to the industrial processes and solvent and other product use sector made in the previous review report. The ERT commends Finland for that.

48. The ERT noted that notation keys in some specific categories (e.g. SF_6 used in aluminium and magnesium foundries, and other (chemical industry – ethylene)) are not used in line with the requirements of the "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories" (hereinafter referred to as the UNFCCC reporting guidelines). In both cases notation key "NO" (not occurring) is used instead of "NA" (not applicable) in CRF tables 2(II).C and 2(I).A-Gs1. The ERT recommends that

Finland correct the use of notation keys in the above-mentioned categories in its annual submission.

2. Key categories

Consumption of halocarbons and SF_6 – HFCs, PFCs

49. The ERT noted that Finland includes emissions from imported and exported products in its emission estimates of HFCs, PFCs and SF_6; these are reported in different subcategories under the category consumption of halocarbons and SF_6. The ERT appreciates such an approach as it generates the most accurate emission estimates, but it also acknowledges that the current suite of CRF tables does not support this reporting. Despite this, the ERT encourages Finland to explore how to provide as much information on AD and emissions as possible in CRF table 2(Ii).F, columns "Filled into new manufactured products", "In operating systems (average annual stocks)", "Remaining in products at decommissioning", "From manufacturing", "From stocks" and "From disposal".

Other (solvent and other product use) – CO_2

50. Non-methane volatile organic compound (NMVOC) emissions from other (fat, edible and non-edible oil extraction) are used to estimate indirect CO_2 emissions. The ERT noted that the NIR includes a detailed methodology description, including that NMVOC/CO_2 emissions from this category arise from biomass. The CRF tables do not facilitate distinguishing between CO_2 emissions from biomass and fossil components under the category total solvent and other product use. This approach slightly overestimates national total CO_2 emissions, as CO_2 emissions from biomass are accounted for under fossil CO_2 emissions. The ERT recommends that Finland develop a way of reporting indirect CO_2 emissions which will allow CO_2 emissions from biomass to be distinguished from those from the fossil component and use this in the CRF tables of its annual submission, and provide an appropriate methodology and process description in its NIR.

D. Agriculture

1. Sector overview

51. In 2011, emissions from the agriculture sector amounted to 5,881.11 Gg CO_2 eq, or 8.8 per cent of total GHG emissions. Since 1990, emissions have decreased by 11.9 per cent. The key drivers for the fall in emissions are a decrease of 32.8 per cent in total cattle populations and a reduction of 36.0 per cent in nitrogen (N) fertilizer use. Within the sector, 60.3 per cent of emissions were from agricultural soils, followed by 27.3 per cent from enteric fermentation, 12.4 per cent from manure management and less than 1.0 per cent from burning of agricultural residues.

52. Based on the recommendations made in the previous review report, Finland has improved the presentation of uncertainties in annex 6 to the NIR, reviewed and carried out QC of its N balance model, modified its pasture, range and paddock N_2O model such that ammonia (NH_3) is not subtracted before calculating N_2O and improved the transparency around the description of the procedure for estimating emissions from organic soils. The ERT commends the Party for rapidly integrating these improvements into its reporting system. The ERT recommends that the Party ensure that it integrates all documentation and explanations associated with these improvements into the NIR in a clear and transparent manner and review the previous review report to ensure that the recommendations and encouragements to improve the transparency of text that were outlined in that report are integrated into the NIR text; in particular, an improved explanation of the placement of

fertilizers and an improvement to the transparency of the description of category-specific QA/QC procedures.

53. In the previous review report, paragraph 72, Finland was recommended to include more information on QA procedures and it was suggested that the Party develop an external peer review system. The Party informed the ERT that it did not have plans for a permanent system for external peer review but several institutes participate in the inventory and data collection and reviews are performed occasionally by sending models and materials for checking in the other institutes. This process is reflected in chapter 1 of the NIR. Furthermore, there is also ongoing activity between Finnish and Swedish experts and it is possible that the cooperation will include reviews in the future. Nonetheless, based on the text in the agriculture chapter of the NIR it is not apparent what standardized process is used as a tier 2 QA/QC for the agricultural emission estimates. The ERT encourages Finland to clearly document the external review QA/QC procedures carried out for the agriculture methodology within the agriculture chapter of the NIR.

54. The ERT noted that in the category-specific QA/QC and verification sections of the NIR that the Party often refers to "comparing emission factors with national data", (e.g. in the tier 2 QC for the EFs section of the enteric fermentation category, page 230). During the review, the Party was asked how comparisons are done, how tier 2 quality verifications are documented and if it could provide examples of recent comparisons between EFs and national (experimental) data for the emission categories for which comparisons are stated to have been carried out, such as enteric fermentation. Finland responded that national measurements on emissions from enteric fermentation have begun recently but no data are published yet. The Party provided the example of the measurement of emissions from slurry storage (unpublished data) in which it was observed that EFs for cattle slurry and dung were fully in accordance with the measurements but those for pig slurry deviated more from the measurements. Since the data were unpublished, the comparison was not included in the NIR. The ERT holds that discussions of verification entail the comparison of model estimates with experimental data. When discussing these verifications in the NIR, there should be a logical presentation of the process: a specific aspect of the emissions model that was compared with specific research results and a presentation of the verification results that were either the same or different. The ERT recommends that Finland improve the transparency of text referring to the verification of the emissions model estimates by including the results of comparisons or removing this text in the "source-specific QA/QC and verification" section of the NIR.

55. Finland has reported non-dairy cattle (CRF tables 4 and 4.A) under the category other animals as non-dairy animal subcategories: bulls, heifers, steers, etc. During the review, the ERT pointed out to the Party that the advantage of reporting under standard IPCC categories is that it improves the comparability of the inventory. The Party replied that it felt that reporting in this way improved transparency. Use of the animal categories contained in the CRF table does facilitate the inventory review process by allowing easy comparisons with other countries, but the increased transparency of reporting all information for non-dairy subcategories noted by the Party is a valid point. The ERT accepts Finland's explanation but encourages the Party to use weighted averages for non-dairy cattle in the CRF tables whenever possible to ease comparability with other Parties included in Annex 1 to the Convention in its annual submission.

2. Key categories

Enteric fermentation – CH_4

56. Finland used a tier 2 approach for estimating CH_4 emissions from enteric fermentation, in line with the Revised 1996 IPCC Guidelines and the IPCC good practice

guidance, with country-specific EFs (divided into the subcategories dairy cows, suckler cows, bulls, heifers and calves) based on national data for the following parameters: weight, weight gain, milk production, milk fat, pasturing and digestible energy. These EFs are transparently described in the NIR. EFs for sheep and reindeer are also calculated using a tier 2 approach. There is less information supplied to describe the parameters used in these calculations, but no key information is lacking from those animal categories. For other animal subcategories, a tier 1 approach and IPCC default EFs were used. In the case of fur animals, Finland used an EF taken from Norway's inventory (0.1 kg/animal/year).

57. Finland reported that a weight gain of zero was used in calculations of enteric fermentation for dairy cows and suckler cows, on page 227 of its NIR; however, in table 6.2-5 in the NIR, live weights are reported that are less than mature weights for the individual cattle categories. This difference would suggest that on average cattle herds are in fact still growing. The choice of zero for this parameter will have an impact on the net energy of growth and probably on N excretion rates in the national N budget model. In response to a question raised by the ERT during the review on the basis for the choice of this growth rate, the Party replied that weight gain figures are based on rather old expert judgements but acknowledged that new values were available that had been integrated into the N excretion model but had not been integrated into the CH_4 model. The ERT noted that this was not in accordance with a single livestock classification outlined in section 4.1 of the IPCC good practice guidance and recognized this issue as an underestimation of enteric fermentation emissions. Finland agreed with this recommendation and submitted revised CRF tables during the review week with growth rates for mature cattle consistent with the N excretion model. The recalculations increased agricultural emissions of CH_4 for all years by less than 1% (14.6 Gg CO_2 eq in 2011) associated with a small increase in gross energy intake for these cattle categories. The ERT recommends that Finland review all aspects of its livestock characterization data, ensure consistency between its N excretion model and its enteric fermentation model in its annual submission and clearly document that a consistent livestock characterization is used in the two models.

Manure management – N_2O

58. Finland uses a country-specific N mass-balance model for the calculation of NH_3 and N_2O emissions from agriculture based on a national document (Grönroos et al., 2009).[3] The model prepares a complete N balance of all inputs from agricultural sources and the output is used in multiple emission categories, including manure management. The model is maintained and updated by SYKE and MTT. SYKE is responsible for the technical updates of the model, as well as for providing animal population data. MTT is responsible for estimating N excretion values. A link to the model documentation is included in the NIR.

59. In the 2011 review report, Finland was encouraged to provide information in the NIR related to the development of a country-specific EF for manure management systems that separates the solid and urine portions of manure. This information is now provided on page 245 of the NIR. In the explanation, no information was given about the proportional division of N between the urine and dung used in the weighting of the EF. This parameter is not universally known and will vary among animals and among animal feeding systems. The ERT contends that, for transparency, the Party must provide this factor and provide the source and assumptions behind the use of that ratio in its methodological description.

[3] Grönroos, J., Mattila, P., Regina, K., Nousiainen, J., Perälä, P., Saarinen, K. and Mikkola-Pusa, J. 2009. *Development of the ammonia emission inventory in Finland*. Finnish Environment Institute. The Finnish Environment 8/2009. 60 p. <http://www.ymparisto.fi/download.asp?contentid=105290&lan=en>.

During the review, Finland supplied an example of the calculation that is carried out to produce this EF, with the rationale included. The ERT recommends that the Party report in the NIR the ratio that is used to divide N between urine and dung, and provide a reference to the source of that information, in its annual submission.

60. On page 237 of the NIR, Finland stated that N utilization for animals had improved but did not supply information about how this had been achieved. The N excretion model is described in the report on the N balance model (Grönroos et al., 2009), not in the NIR, and the ERT observed that detail was missing in the document about N excretion. It was not clear what parameters had changed in Finland that resulted in an improved N balance. During the review, a question was posed to the Party about the text in section 6.3.2.2 of the NIR and the external report linked to the NIR (Grönroos et al., 2009) regarding how the calculation of N excretion is carried out. Supplementary information was provided to the ERT on the details on animal feed that are fed into the model. The ERT takes the position that when statements about trends in emissions are made, for transparency, the Party should clearly indicate what has changed and how that change has been integrated into calculations of emissions by making reference to the type of data and the data source. The ERT recommends that the Party integrate into the NIR a more detailed explanation of the N excretion methodology related to feed input trends, as well as productivity data trends, including references for the sources of those data, in its annual submission.

Direct soil emissions – N_2O

61. Finland used a tier 1 approach for estimating N_2O emissions from agricultural soils, in line with the IPCC good practice guidance, using the tier 1b approach for crop residue emissions with some minor modifications and default tier 1 EFs. Country-specific parameters are used to estimate NH_3 volatilization, based on the N balance model described by Grönroos et al. (2009). The methodological description is brief, but the necessary elements to evaluate the model and AD are included in the NIR.

62. In table 6.4-5 in the NIR, Finland reported crop yields, referring to the total national crop production (Gg/annum). In evaluating emission trends and AD the ERT noted that the total of all the crops listed for 1990 (adding all crops together) was 20.0 per cent greater than the average for the rest of the reporting period, between 1991 and 2011. In response to a question raised by the ERT during the review the Party responded that agricultural production changed considerably in the beginning of the 1990s due to Finland's decision to join the EU. Many farms were given up and the area of fallow more than doubled in 1990–1991 and remained at that level in 1991–1995. The total area (including fallow) diminished by 7.0 per cent in 1995–1996 after Finland joined the EU in 1995. Thus, first the production of grain was diminished and the respective area of fallow land increased and later the area was transferred to other land uses. The ERT accepts this explanation, but recommends that Finland include this information in its discussion of trends in agricultural emissions, as the reduction in emissions from agricultural soils appears to be the most predominant trend in the time series, in its annual submission.

63. In CRF table 4.D, Finland has reported the value for $Frac_{NCRBF}$ as "NA", whereas it has been reported as a value in previous submissions. The Party noted that in the past, the reported value has been a simple average of the N fraction in N-fixing plants and it has not taken crop yields and dry matter contents into account. In the actual calculation each plant is calculated separately and then N amounts summed up. Total $Frac_{NCRBF}$ has only been used for reporting. The ERT recommends that the Party add the $Frac_{NCRBF}$ value to the CRF tables in the form of a weighted average in its annual submission.

Indirect emissions – N_2O

64. Finland also uses its country-specific N mass-balance model for the calculation of NH_3 emissions and leaching of N from agriculture, based on the national document by Grönroos et al. (2009). N_2O emissions are calculated using tier 1 default EFs.

65. The ERT noted that Finland uses a low fraction of synthetic fertilizer N applied to soils that volatises as NH_3 and nitrogen oxides (NO_X) ($Frac_{GASF}$) (0.0146), which is lower than the IPCC default value of 0.1 from table 4-19 in the Revised 1996 IPCC Guidelines and among the lowest of all reporting Parties (0.0075–0.25). The use of this low factor appears to be due to both the fertilizer application methods and the types of fertilizers that are sold in Finland; for example, according to table 12 in the document by Grönroos et al. (2009), 80.2 per cent of applied fertilizers are "other NK and NPK", and there is no urea applied in Finland. The Party was asked to supply some supplemental information as to what the "other NK and NPK" fertilizers are, and explain why urea, an abundant and low-cost fertilizer, is not used in Finland. As a follow-up, and based on data from FAOSTAT, the database of the Food and Agriculture Organization of the United Nations (FAO), the Party noted that urea does appear in an irregular manner in Finland. A second inquiry was sent about observations of urea imports contained in FAOSTAT. The Party responded that "other NK and NPK" fertilizers consist of tens of different fertilizers which have an N content ranging from 3.0 to 27.0 per cent (as ammonium (NH_4-N) and nitrate nitrogen (NO_3-N)) and that urea is only rarely used in Finnish agriculture and the main use of the urea that is sold is in forestry. The FAO data were noted to be inconsistent, and the Party stated that inconsistencies demonstrating greater urea use in 2009–2010 are probably errors in the FAO data. Inquiries to TIKE (Information Centre of the Ministry of Agriculture and Forestry) showed that no surveys have been done on the use of urea in agriculture. Finland acknowledged that it has not identified a suitable method for estimating the consumption of urea but all available expert judgements estimate that the use is of minor importance and that urea is not really suitable for use in a country with a short growing season and acid soils. The ERT accepts this explanation but recommends that Finland review national data on fertilizer use and provide in the NIR a description of the distribution of fertilizer types used in Finland and document the source of that information in its annual submission.

3. Non-key categories

Manure management – CH_4

66. In section 6.3.2.3 of the NIR, Finland explains why the methane conversion factor (MCF) of 10.0 per cent is chosen for liquid manure CH_4 emissions, stating that a Swedish review supported the use of this value, as well as the 2006 IPCC Guidelines (10.0 per cent referring to storage with natural crust cover). The Party was asked to supply supplemental information with respect to the particular characteristics of the liquid storage systems in Finland which, in its opinion, support the use of a value that is lower than the lowest default value for liquid manure management systems in the IPCC good practice guidance (39 per cent in table 4.10). According to the Party, a paper by Sommer and Husted (1995)[4] represents one of the few studies that could be found which includes measurements over a full seasonal cycle in a cold climate and is one of the few studies found in which there is sufficient information reported to allow MCF values to be calculated without making vast assumptions regarding manure volumes and characteristics. The ERT agrees that the Party has based its MCF on studies and practices in countries with similar climates and similar agricultural practices. The MCF is a parameter that has a great deal of uncertainty. Finland

[4] Sommer, S.G. and Husted, S. (1995). The Chemical Buffer System in Raw and Digested Animal Slurry. *J. Agric. Sci.*, 124 , 45–53.

has been consistent throughout its inventories in its use of this MCF but has not provided country-specific data that specifically support this choice. The ERT recommends that Finland produce and report in its NIR country-specific information or data that justify its choice of an EF that is lower than the default EF.

E. Land use, land-use change and forestry

1. Sector overview

67. In 2011, net removals from the LULUCF sector amounted to 24,577.44 Gg CO_2 eq. Since 1990, net removals have increased by 62.1 per cent. The key driver for the rise in removals is the increase in the annual increment in the carbon stock in living biomass in forest land remaining forest land. Within the sector, 36,146.76 Gg CO_2 eq of removals were from forest land remaining forest land, followed by 84.68 Gg CO_2 eq from land converted to grassland. Cropland remaining cropland accounted for net emissions of 5,510.89 Gg CO_2 eq and land converted to wetlands accounted for 1,983.21 Gg CO_2 eq. The remaining net emissions of 3,962.73 Gg CO_2 eq were from all other categories within the sector, including harvested wood products (HWPs). Settlements and other land are reported as "NE" (not estimated), "IE" (included elsewhere), "NA" and "NO".

2. Key categories

Land converted to forest land – CO_2

68. The ERT identified that Finland has reported cropland conversion to forest land, but the Party continues to report other conversions to forest land as "IE" in CRF table 5.A. In response to a question raised by the ERT during the review, Finland explained the reason for this reporting is that the losses in carbon stocks in the living biomass of trees were not estimated separately because the method used gives an estimate of the average net growth of the growing stock. The ERT reiterates the recommendation made in the previous review report on this matter that Finland include in its annual submission an enhanced description of the method used for estimating and reporting losses in carbon stocks in living biomass for all types of land converted to forest land.

Grassland remaining grassland – CO_2

69. Finland has reported carbon stock changes in living biomass as "NE" in CRF table 5.C. The ERT considers that this reporting is not in line with the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry* (hereinafter referred to as the IPCC good practice guidance for LULUCF). The ERT reiterates the recommendation made in the previous review report that Finland report carbon stock changes associated with the living biomass pool in its annual submission.

70. Finland has reported a total uncertainty in grassland remaining grassland in the range of –256 to +328 per cent, and a corresponding range for land converted to grassland of –412 to +455 per cent (see NIR, page 310). The ERT considers this to be high because the overall emission uncertainty is ranged only –25 per cent to +34 per cent (see NIR, page 506). In response to a recommendation of the previous review report, Finland indicated that it plans to improve its methods for estimating uncertainties for all land-use categories. The ERT recommends that Finland report on its progress to improve the uncertainties in the LULUCF sector in its annual submission.

3. Non-key categories

Wetlands remaining wetlands – CO_2

71. Finland reported in CRF table 5.D for 2011 an area of 2,867.52 kha as wetlands remaining wetlands that excludes inland waters. In table 7.1-4 of the NIR, the area of wetlands remaining wetlands is 2,957 kha. The ERT recommends that Finland correct this inconsistency in the annual submission.

Other (LULUCF) – CO_2

72. Finland reported different CO_2 emissions from agricultural lime application between NIR table 7.1-2 and CRF table 5(IV). During the review, Finland informed the ERT that there are erroneous figures in table 7.1-2 in the row "Liming". Only liming of cropland is included in these figures and the liming of grassland is missing. The ERT recommends that Finland accurately report these figures in its annual submission.

F. Waste

1. Sector overview

73. In 2011, emissions from the waste sector amounted to 2,111.73 Gg CO_2 eq, or 3.2 per cent of total GHG emissions. Since 1990, emissions have decreased by 46.9 per cent. The key drivers for the fall in emissions from solid waste disposal on land are the implementation of the new Waste Act (1994) and the EU landfill directive (1999/31/EC) endorsing the minimization of waste generation, recycling and reuse of waste materials, landfill gas recovery and alternative waste treatment methods and the implementation of N purification technologies in wastewater handling plants. The main driver for the decreasing emissions from wastewater handling is the decreasing volume of uncollected domestic wastewater. Emissions from composting reported under other (waste) are increasing as a result of increasing recovery of organic waste due to the implementation of the above-mentioned EU landfill directive. Within the sector, 83.8 per cent of the emissions were from solid waste disposal on land, followed by 10.1 per cent from wastewater handling and 6.1 per cent from other (waste). Emissions from waste incineration were reported as "IE", as these are, correctly, reported in the energy sector.

74. The ERT found that the transparency of the waste incineration category could be improved with information on waste types, incineration technology and energy recovery. In response to a question raised by the ERT during the review, Finland provided such information about hazardous, clinical waste, papers and paperboards incineration practices and the energy recovery practice from incineration The ERT recommends that Finland include this information in its annual submission.

75. The ERT commends Finland for the improvements made in the waste sector, including those mentioned above. Finland has an inventory improvement plan that strives to improve the certainty of waste sector emission estimates by improving the quality of AD and EFs for solid waste disposal on land, composting and wastewater handling. The ERT encourages Finland to continue reporting on improvements made in the waste sector in its annual submission.

2. Key categories

Solid waste disposal on land – CH_4

76. Finland uses the IPCC tier 2 first-order decay method to estimate CH_4 emissions. This is in line with the IPCC good practice guidance for key categories. AD are obtained

from the national VAHTI system, which includes all information on landfills in Finland except in the Åland region which is estimated based on population. The VAHTI system contains data on all municipal solid waste (MSW) amounts from 1997 onwards, and the data are registered according to the European Waste Catalogue classification. This classification was converted by Finland into the classification required for the inventory. AD for other years were collected from other official, scientific and statistical sources, surveys and research. To cover all the variety of Finnish MSW composition, the EFs used are mostly default values taken from the 2006 IPCC Guidelines, corrected (in some cases) and complemented by expert judgement, national research and measurements.

77. The composition of MSW that is deposited on landfills is derived from the estimated composition of generated MSW and waste fraction data. Data for landfill gas recovery were taken from the Finnish Biogas Plant Register. The ERT noted that there is an observed significant increase in the gas recovery from 2000 that corresponds with the implementation of the regulations of landfill gas recovery (Council of State Decree 861/1997 on Landfills). In response to a question raised by the ERT during the review in relation to the reported zero recovery figures for several plants presented in the list of the landfill gas recovery plants (see Appendix 8(b) in the NIR), Finland explained that this is due to the temporary inoperativeness of the plants. The ERT recommends that the Party include this clarification in its annual submission.

Other (waste) – CH_4

78. Emissions from composting have steadily increased. The ERT reiterates a recommendation made in the previous review report that the Party improve the transparency of the composting category in relation to enhanced descriptions in the NIR on AD for composted waste and the destination of industrial waste and sludge from wastewater handling plants in its annual submission.

3. Non-key categories

Wastewater handling – N_2O

79. The ERT noted that N_2O emissions from industrial wastewater are reported as "NE" in CRF table 6.B. However, Finland reports on N input-related N_2O emissions from industrial wastewater and fish farming in the category other (wastewater handling) in CRF table 6.B. The ERT commends the Party for including these emissions, and encourages Finland to provide an enhanced explanation in its next annual submission on why these emissions are not presented under industrial wastewater.

G. Supplementary information required under Article 7, paragraph 1, of the Kyoto Protocol

1. Information on activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

Overview

80. Table 6 provides an overview of the information reported and parameters selected by the Party under Article 3, paragraphs 3 and 4, of the Kyoto Protocol.

Table 6
Supplementary information reported under Article 3, paragraphs 3 and 4, of the Kyoto Protocol

	Findings and recommendations
Has the Party reported information in accordance with the requirements in paragraphs 5–9 of the annex to decision 15/CMP.1?	Sufficient
Identify any elected activities under Article 3, paragraph 4, of the Kyoto Protocol	Activities elected: forest management Years reported: 2008, 2009, 2010, 2011
Identify the period of accounting	Commitment period accounting
Assessment of the Party's ability to identify areas of land and areas of land-use change	Sufficient

Activities under Article 3, paragraph 3, of the Kyoto Protocol

Afforestation and reforestation – CO_2

81. Finland is planning to further develop the methods for area estimation as well the methods for estimating the emissions and removals of GHGs for each Article 3, paragraph 3, activity. The ERT noted from the 2013 NIR (section 11.3.1.5) that Finland intends by the 2014 annual submission to have enhanced the estimation of afforestation and reforestation areas, and to use the NFI data for 2009–2012 to improve the increment estimates for the growing stock on afforestation and reforestation areas. The ERT commends Finland on its efforts to significantly enhance its KP-LULUCF inventory and recommends that the Party report thereon in its annual submission.

Deforestation – CO_2

82. The emissions from liming, including limestone, dolomite and briquette lime, have been reported under deforestation. The method and EFs used are in line with the IPCC good practice guidance for LULUCF. However, the ERT could not reconcile easily why AD are not obtained/derived from the same sources. The description provided in the NIR (section 7.3.2.3) differs from the corresponding description provided in CRF table 5(KP-II)4, which indicates that the data are based on using an average amount of 19 t/ha of lime. The ERT recommends that Finland in its annual submission clearly explain the source of liming data and/or how they are derived and any differences in its treatment in reporting deforestation under the Convention and under the Kyoto Protocol.

Activities under Article 3, paragraph 4, of the Kyoto Protocol

Forest management – CO_2

83. In response to a recommendation made in the previous review report, Finland has included in the 2013 annual submission improved information on the method used to estimate emissions from carbon stock changes in living biomass, and N_2O emissions from

N fertilization and from biomass burning. The ERT commends Finland for its efforts to enhance the transparency of the annual submission.

2. Information on Kyoto Protocol units

Standard electronic format and reports from the national registry

84. Finland has reported information on its accounting of Kyoto Protocol units in the required SEF tables, as required by decisions 15/CMP.1 and 14/CMP.1. The ERT took note of the findings and recommendations included in the standard independent assessment report (SIAR) on the SEF tables and the SEF comparison report.[5] The SIAR was forwarded to the ERT prior to the review, pursuant to decision 16/CP.10.

85. Information on the accounting of Kyoto Protocol units has been prepared and reported in accordance with decision 15/CMP.1, annex, chapter I.E, and reported in accordance with decision 14/CMP.1 using the SEF tables. This information is consistent with that contained in the national registry and with the records of the international transaction log (ITL) and the clean development mechanism registry and meets the requirements referred to in decision 22/CMP.1, annex, paragraph 88(a–j).

Calculation of the commitment period reserve

86. Finland has reported its commitment period reserve in its 2013 annual submission. The Party reported that its commitment period reserve has not changed since the initial report review (319,515,791 t CO_2 eq) as it is based on the assigned amount and not the most recently reviewed inventory. The ERT agrees with this figure.

3. Changes to the national system

87. Finland reported that there are no changes in its national system since the previous annual submission. The ERT concluded that the Party's national system continues to be in accordance with the requirements of national systems outlined in decision 19/CMP.1.

4. Changes to the national registry

88. Finland reported that there are changes in its national registry since the previous annual submission. The Party described the changes, specifically due to the centralization of the EU ETS operations into a single European Union registry operated by the European Commission called the Consolidated System of EU registries (CSEUR), in its NIR (see page. 447). The CSEUR is a consolidated platform which implements the national registries in a consolidated manner and was developed together with the new EU registry.

89. The ERT noted that there were recommendations in the SIAR that had not been addressed related to the CSEUR, in particular recommendations related to reporting a description of the changes in database structure and reporting of test results. In response to questions raised by the ERT during the review, Finland provided further confidential information on the changes to the national registry, including on reporting a description of the changes in database structure and reporting of test results.

90. The ERT concluded that, taking into account the confirmed changes in the national registry, including additional information provided to the ERT during the review, Finland's national registry continues to perform the functions set out in the annex to decision

[5] The SEF comparison report is prepared by the international transaction log (ITL) administrator and provides information on the outcome of the comparison of data contained in the Party's SEF tables with corresponding records contained in the ITL.

13/CMP.1 and the annex to decision 5/CMP.1 and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant decisions of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP). With respect to the provision of information related to database structure specifically, the ERT encourages the Party to provide additional information in the NIR. The ERT recommends that Finland include all other additional information in response to the SIAR findings in its NIR in accordance with decision 15/CMP.1, annex, chapter I.G.

5. Minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol

91. Finland reported its actions undertaken to minimize the adverse impacts of response measures in developing countries for recent years. The Party reported minor changes in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol since the previous annual submission. These changes relate to an update of the number and names of countries covered by the Energy and Environment Partnership programme. The Party described the changes in its NIR. The ERT concluded that, taking into account the confirmed changes in the reporting, the information provided is complete and transparent.

92. Among the actions undertaken to minimize the adverse impacts the Party reported that: starting from January 2011, Finland made a major revision in energy taxation according to which all fuels are taxed based on their energy and fossil carbon content; and Finland is supporting Cambodia and Namibia to develop comprehensive energy strategies, data and planning capacity, taking into account sustainability as well as efficiency issues.

III. Conclusions and recommendations

A. Conclusions

93. Table 7 below summarizes the ERT's conclusions on the 2013 annual submission of Finland, in accordance with the Article 8 review guidelines.

Table 7
Expert review team's conclusions on the 2013 annual submission of Finland

	Cross-references
The ERT concludes that the inventory submission of Finland is complete (categories, gases, years and geographical boundaries and contains both an NIR and CRF tables for 1990–2011)	
Annex A sources[a]	Complete
LULUCF[a]	Complete
KP-LULUCF	Complete
The ERT concludes that the inventory submission of Finland has been prepared and reported in accordance with the UNFCCC reporting guidelines	Yes
The submission of information required under Article 7, paragraph 1, of the Kyoto Protocol has been prepared and reported in accordance with decision 15/CMP.1	Yes

		Cross-references
The Party's inventory is in accordance with the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories* and the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*	Yes	
Reporting of activities under Article 3, paragraphs 3 and 4, is in accordance with decision 15/CMP.1	Yes	
The Party has reported information on its accounting of Kyoto Protocol units in accordance with decision 15/CMP.1, annex, chapter I.E, and used the required reporting format tables as specified by decision 14/CMP.1	Yes	
The national system continues to perform its required functions as set out in the annex to decision 19/CMP.1	Yes	
The national registry continues to perform the functions set out in the annex to decision 13/CMP.1 and the annex to decision 5/CMP.1 and continues to adhere to the technical standards for data exchange between registry systems in accordance with relevant CMP decisions	Yes	
Did the Party provide information in the NIR on changes in its reporting of the minimization of adverse impacts in accordance with Article 3, paragraph 14, of the Kyoto Protocol?	Yes	

Abbreviations: Annex A sources = sources included in Annex A to the Kyoto Protocol, CMP = Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol, CRF = common reporting format, ERT = expert review team, IPCC = Intergovernmental Panel on Climate Change, KP-LULUCF = LULUCF emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NIR = national inventory report, UNFCCC reporting guidelines = "Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories".

[a] The assessment of completeness by the ERT considers only the completeness of reporting of mandatory categories (i.e. categories for which methods and default emission factors are provided in the IPCC *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*, the IPCC *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*, or the IPCC *Good Practice Guidance for Land Use, Land-Use Change and Forestry*).

B. Recommendations

94. The ERT identified the issues for improvement listed in table 8. All recommendations are for the next annual submission, unless otherwise specified.

Table 8
Recommendations identified by the expert review team

Sector	*Category*	*Recommendation*	*Paragraph cross-references*
Cross-cutting	QA/QC	Check the description in the NIR against the information and figures reported in the CRF tables	15
Energy	Energy data	Make efforts to provide more detailed AD in the 2015 submission	26

Sector	*Category*	*Recommendation*	*Paragraph cross-references*
	Feedstocks and non-energy use of fuels	Include information on the assumptions and allocation of emissions related to the use of lubricants	33 and 34
		Correct the discrepancy between the liquid fuels data given in CRF tables 1.A(c) and 1.A(d) for the years 2002 and 2011	35
	Stationary combustion: solid fuels – CO_2	Investigate the time-series consistency of the CO_2 EF; for example explore whether there have been changes in the country of origin of the coal or whether changes in the net calorific value of coal could explain the decrease in the CO_2 EF	40
	Stationary combustion: liquid fuels – CO_2 (petroleum refining)	Provide an update on the findings of its investigation into the drop in the CO_2 IEF value for liquid fuels used in petroleum refining between 2004 and 2005	42
	Road transportation: liquid fuels – CO_2	Include the correct range of values in its annual submission	45
Industrial processes and solvent and other product use	Notation keys	Correct the use of notation keys in certain categories	48
	Other (solvent and other product use) – CO_2	Develop a way of reporting indirect CO_2 emissions which will allow CO_2 emissions from biomass to be distinguished from those from the fossil component and use this in the CRF tables of its next submission, and provide an appropriate methodology and process description	50
Agriculture	Transparency	Ensure that all documentation and explanations associated with the improvements in its reporting are integrated in a clear and transparent manner and review the 2012 annual review report to ensure that the improvements in transparency of text that were outlined in that review are integrated into the NIR text; in particular, improve the explanation of the placement of fertilizers and improve the transparency of the description of category-specific QA/QC procedures	52
		Improve the transparency of text referring to the verification of the emissions model estimates by including the results of comparisons or removing this text in the "Source-specific QA/QC and verification" section of the NIR	54
	Enteric fermentation – CH_4	Review all aspects of its livestock characterization data and ensure consistency between the N excretion model and the enteric fermentation model	57
	Manure management –	Report in the text of the NIR the ratio that is used to divide N between urine and dung, and provide a reference to the	59

Sector	*Category*	*Recommendation*	*Paragraph cross-references*
	N_2O	source of that information	
		Integrate into the NIR a more detailed explanation of the N excretion methodology related to feed input trends, as well as productivity data trends, including references for the sources of those data	60
	Direct soil emissions – N_2O	Include information on the structural development of Finnish agriculture in the 1990'ties including the significant decrease in crop production between 1990 and 1991 in its discussion of trends in agricultural emissions	62
		Add the $Frac_{NCRBF}$ value to the CRF tables in the form of a weighted average	63
	Indirect emissions – N_2O	Review national data on fertilizer use and provide in the next NIR a description of the distribution of fertilizer types used in Finland and document the source of that information	65
	Manure management – CH_4	Produce and report in its NIR country-specific information or data that justify the choice of an EF that is lower than the default EF	66
LULUCF	Land converted to forest land – CO_2	Include in the next annual submission an enhanced description of the method used for estimating and reporting losses in carbon stocks in living biomass for all types of land converted to forest land	68
	Grassland remaining grassland – CO_2	Report carbon stock changes associated with the living biomass pool	69
		Report on its progress to improve the uncertainties in the LULUCF sector in its next annual submission	70
	Wetlands remaining wetlands – CO_2	Correct the inconsistency regarding area in the next annual submission	71
	Other (LULUCF) – CO_2	Accurately report the figures for lime application in its next annual submission	72
Waste	Transparency	Include information on waste types, incineration technology and energy recovery in its next annual submission	74
	Solid waste disposal on land – CH_4	Include the clarification regarding data for landfill gas recovery in its next annual submission	77

Sector	*Category*	*Recommendation*	*Paragraph cross-references*
	Other (composting) – CH_4	Improve the transparency of the composting inventory in relation to enhanced descriptions in the NIR on AD for composted waste and the destination of industrial waste and sludge from wastewater handling plants	78
KP-LULUCF	Afforestation and reforestation – CO_2	Report on the efforts to significantly enhance its KP-LULUCF inventory in the next annual submission	81
		Clearly explain the source of liming data and/or how they are derived and any differences in its treatment in reporting deforestation under the Convention and under the Kyoto Protocol	82
Changes in national registry		Include all other additional information in response to the SIAR findings in its NIR in accordance with decision 15/CMP.1, annex, chapter I.G.	90

Abbreviations: AD = activity data, CRF = common reporting format, EF = emission factor, ERT = expert review team, IEF = implied emission factor, KP-LULUCF = land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol, LULUCF = land use, land-use change and forestry, NIR = national inventory report, QA/QC = quality assurance/quality control.

IV. Questions of implementation

95. No questions of implementation were identified by the ERT during the review.

Annex I

Background data on recalculations and information to be included in the compilation and accounting database

Table 9
Recalculations in the 2013 annual submission for the base year and the most recent year

Greenhouse gas source and sink categories	*1990*	*2010*	*1990*	*2010*	*Reason for the recalculation*
	Value of recalculation (Gg CO_2 eq)		*Per cent change*		
1. Energy					AD, EF
A. Fuel combustion (sectoral approach)					
1. Energy industries	–	–56.66	–	–0.2	
2. Manufacturing industries and construction	–	–18.59	–	–0.2	
3. Transport	–	–139.73	–	–1.0	
4. Other sectors	–257.01	–289.27	–3.5	–5.7	
5. Other	257.17	407.02	16.8	29.8	
B. Fugitive emissions from fuels					
1. Solid fuels	–	–	–	–	
2. Oil and natural gas	0.08	–1.82	0.03	–1.0	
2. Industrial processes					AD
A. Mineral products	8.79	9.52	0.7	0.8	
B. Chemical industry	1.02	–6.7	0.1	–0.7	
C. Metal production	–	–	–	–	
D. Other production	–	–	–	–	
E. Production of halocarbons and SF_6	–	–	–	–	
F. Consumption of halocarbons and SF_6	20.55	3.82	21.8	0.003	
G. Other	–	–	–	–	
3. Solvent and other product use	–	0.16	–	0.2	Correction of formulas
4. Agriculture					AD
A. Enteric fermentation	13.82	20.51	0.7	1.3	
B. Manure management	0.97	–0.77	0.1	–0.1	
C. Rice cultivation					
D. Agricultural soils	41.57	68.42	1.1	1.9	
E. Prescribed burning of savannas	–	–	–	–	
F. Field burning of agricultural residues	–	–0.001	–	–0.2	
G. Other					
5. Land use, land-use change and forestry					AD, Improved completeness

Greenhouse gas source and sink categories	*1990*	*2010*	*1990*	*2010*	*Reason for the recalculation*
	Value of recalculation (Gg CO_2 eq)		*Per cent change*		
A. Forest land	344.22	–2 962.35	–1.5	9.0	
B. Cropland	95.85	675.44	1.7	11.7	
C. Grassland	–45.28	–370.78	–5.6	–56.5	
D. Wetlands	52.50	–18.99	4.0	–0.9	
E. Settlements	108.90	–77.86	13.3	–4.4	
F. Other land					
G. Other	–	212.54	–	51 8	
6. Waste					
A. Solid waste disposal on land	–	–	–		AD
B. Wastewater handling	–	–0.13	–	–0.06	
C. Waste incineration	–	–	–	–	
D. Other	–	–	–	–	
7. Other					
Total CO_2 equivalent without LULUCF	86.95	–4.20	0.1	–0.01	
Total CO_2 equivalent with LULUCF	643.14	–2 546.21	1.2	–4.9	

Abbreviations: AD = change in activity data, EF = change in emission factor, LULUCF = land use, land-use change and forestry.

Table 10
Information to be included in the compilation and accounting database in t CO_2 eq for 2011, including the commitment period reserve

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Commitment period reserve	319 515 791			319 515 791
Annex A emissions for 2011				
CO_2	56 492 845			56 492 845
CH_4	4 205 167	4 219 745		4 219 745
N_2O	5 257 738			5 257 738
HFCs	1 025 910			1 025 910
PFCs	1 376			1 376
SF_6	35 821			35 821
Total Annex A sources	**67 018 856**	**67 033 434**		**67 033 434**
Activities under Article 3, paragraph 3, for 2011				
3.3 Afforestation and reforestation on non-harvested land for 2011	158 445			158 445
3.3 Afforestation and reforestation on harvested land for 2011	NA			NA
3.3 Deforestation for 2011	3 301 056			3 301 056
Activities under Article 3, paragraph 4, for 2011[c]				
3.4 Forest management for 2011	–34 792 800			–34 792 800
3.4 Cropland management for 2011				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2011				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2011				
3.4 Revegetation in the base year				

Abbreviation: NA = not applicable.
[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 11
Information to be included in the compilation and accounting database in t CO_2 eq for 2010

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2010				
CO_2	63 584 084			63 584 084
CH_4	4 338 322	4 353 035		4 353 035
N_2O	5 414 538			5 414 538
HFCs	1 163 958			1 163 958
PFCs	750			750
SF_6	35 068			35 068
Total Annex A sources	**74 536 721**	**74 551 434**		**74 551 434**
Activities under Article 3, paragraph 3, for 2010				
3.3 Afforestation and reforestation on non-harvested land for 2010	184 008			184 008
3.3 Afforestation and reforestation on harvested land for 2010	NA			NA
3.3 Deforestation for 2010	3 489 577			3 489 577
Activities under Article 3, paragraph 4, for 2010[c]				
3.4 Forest management for 2010	–34 622 541			–34 622 541
3.4 Cropland management for 2010				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2010				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2010				
3.4 Revegetation in the base year				

Abbreviation: NA = not applicable.
[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 12
Information to be included in the compilation and accounting database in t CO_2 eq for 2009

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2009				
CO_2	55 056 578			55 056 578
CH_4	4 285 970	4 300 694		4 300 694
N_2O	5 759 681			5 759 681
HFCs	888 831			888 831
PFCs	9 317			9 317
SF_6	49 820			49 820
Total Annex A sources	**66 050 196**	**66 064 921**		**66 064 921**
Activities under Article 3, paragraph 3, for 2009				
3.3 Afforestation and reforestation on non-harvested land for 2009	205 581			205 581
3.3 Afforestation and reforestation on harvested land for 2009	NA			NA
3.3 Deforestation for 2009	3 295 392			3 295 392
Activities under Article 3, paragraph 4, for 2009[c]				
3.4 Forest management for 2009	–49 749 046			–49 749 046
3.4 Cropland management for 2009				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2009				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2009				
3.4 Revegetation in the base year				

Abbreviation: NA = not applicable.
[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Table 13
Information to be included in the compilation and accounting database in t CO_2 eq for 2008

	As reported	*Revised estimates*	*Adjustment*[a]	*Final*[b]
Annex A emissions for 2008				
CO_2	58 006 789			58 006 789
CH_4	4 362 118	4 376 728		4 376 728
N_2O	6 785 859			6 785 859
HFCs	993 190			993 190
PFCs	11 231			11 231
SF_6	51 158			51 158
Total Annex A sources	**70 210 344**	**70 224 954**		**70 224 954**
Activities under Article 3, paragraph 3, for 2008				
3.3 Afforestation and reforestation on non-harvested land for 2008	217 088			217 088
3.3 Afforestation and reforestation on harvested land for 2008	NA			NA
3.3 Deforestation for 2008	3 606 938			3 606 938
Activities under Article 3, paragraph 4, for 2008[c]				
3.4 Forest management for 2008	–39 039 772			–39 039 772
3.4 Cropland management for 2008				
3.4 Cropland management for the base year				
3.4 Grazing land management for 2008				
3.4 Grazing land management for the base year				
3.4 Revegetation for 2008				
3.4 Revegetation in the base year				

Abbreviation: NA = not applicable.
[a] "Adjustment" is relevant only for Parties for which the expert review team has calculated one or more adjustment(s).
[b] "Final" includes revised estimates, if any, and/or adjustments, if any.
[c] Activities under Article 3, paragraph 4, are relevant only for Parties that elected one or more such activities.

Annex II

Documents and information used during the review

A. Reference documents

Intergovernmental Panel on Climate Change. *2006 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/2006gl/index.html>.

Intergovernmental Panel on Climate Change. *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gl/invs1.htm>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gp/english/>.

Intergovernmental Panel on Climate Change. *Good Practice Guidance for Land Use, Land-Use Change and Forestry*. Available at <http://www.ipcc-nggip.iges.or.jp/public/gpglulucf/gpglulucf.htm>.

"Guidelines for the preparation of national communications by Parties included in Annex I to the Convention, Part I: UNFCCC reporting guidelines on annual inventories". FCCC/SBSTA/2006/9. Available at <http://unfccc.int/resource/docs/2006/sbsta/eng/09.pdf>.

"Guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention". FCCC/CP/2002/8. Available at <http://unfccc.int/resource/docs/cop8/08.pdf>.

"Guidelines for national systems under Article 5, paragraph 1, of the Kyoto Protocol". Decision 19/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=14>.

"Guidelines for the preparation of the information required under Article 7 of the Kyoto Protocol". Decision 15/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=54>.

"Guidelines for review under Article 8 of the Kyoto Protocol". Decision 22/CMP.1. Available at <http://unfccc.int/resource/docs/2005/cmp1/eng/08a03.pdf#page=51>.

Status report for Finland 2013. Available at <http://unfccc.int/resource/docs/2013/asr/fin.pdf>.

Synthesis and assessment report on the greenhouse gas inventories submitted in 2013. Available at <http://unfccc.int/resource/webdocs/sai/2013.pdf>.

FCCC/ARR/2012/FIN. Report of the individual review of the annual submission of Finland submitted in 2012. Available at <http://unfccc.int/resource/docs/2012/arr/fin.pdf>.

UNFCCC. *Standard Independent Assessment Report*, parts I and II. Available at <http://unfccc.int/kyoto_protocol/registry_systems/independent_assessment_reports/items/4061.php>.

B. Additional information provided by the Party

Responses to questions during the review were received from Ms. Riitta Pipatti (Statistics Finland), including additional material on the methodology and assumptions used.

Annex III

Acronyms and abbreviations

AD	activity data
CH_4	methane
CO_2	carbon dioxide
CO_2 eq	carbon dioxide equivalent
CRF	common reporting format
EF	emission factor
ERT	expert review team
EU	European Union
EU ETS	EU emissions trading scheme
FAO	Food and Agriculture Organization of the United Nations
FracGASF	Fraction of synthetic fertilizer N applied to soils that volatilizes as ammonia and nitrogen oxide
FracNCRBF	Fraction of total above-ground biomass of N-fixing crop that is N
GHG	greenhouse gas; unless indicated otherwise, GHG emissions are the sum of CO_2, CH_4, N_2O, HFCs, PFCs and SF_6 without GHG emissions and removals from LULUCF
HFCs	hydrofluorocarbons
HWPs	harvested wood products
IE	included elsewhere
IEA	International Energy Agency
IEF	implied emission factor
IPCC	Intergovernmental Panel on Climate Change
ITL	international transaction log
kha	kilohectare
KP-LULUCF	land use, land-use change and forestry emissions and removals from activities under Article 3, paragraphs 3 and 4, of the Kyoto Protocol
LULUCF	land use, land-use change and forestry
MCF	methane conversion factor
MSW	municipal solid waste
N	nitrogen
N_2O	nitrous oxide
NA	not applicable
NE	not estimated
NH3	ammonia
NIR	national inventory report
NMVOC	Non-methane volatile organic compound
NO	not occurring
NO_X	nitrogen oxides
PFCs	perfluorocarbons
PCC	precipitated calcium carbonate
PJ	petajoule (1 PJ = 1015 joule)
QA/QC	quality assurance/quality control
SEF	standard electronic format
SF_6	sulphur hexafluoride
SIAR	standard independent assessment report
TJ	terajoule (1 TJ = 1012 joule)
UNFCCC	United Nations Framework Convention on Climate Change